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INVESTIGATION PLAN

FOR LEAKING DEEP

MULTI - AQUIFER WELLS



A RESOURCE ENGINEERING COMPANY

**INVESTIGATION PLAN FOR  
LEAKING DEEP MULTI-AQUIFER WELLS**

**ERT DOCUMENT NO. E876-100**

**September, 1987**

**Amended November, 1987**

**Prepared For:**

**The City of St. Louis Park  
St. Louis Park, Minnesota 55416**

**ERT - A RESOURCE ENGINEERING COMPANY  
5871 Cedar Lake Road, St. Louis Park, Minnesota 55416**

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**SECTION A**

**SITE MANAGEMENT PLAN**

## SITE MANAGEMENT PLAN

### PURPOSE AND SCOPE

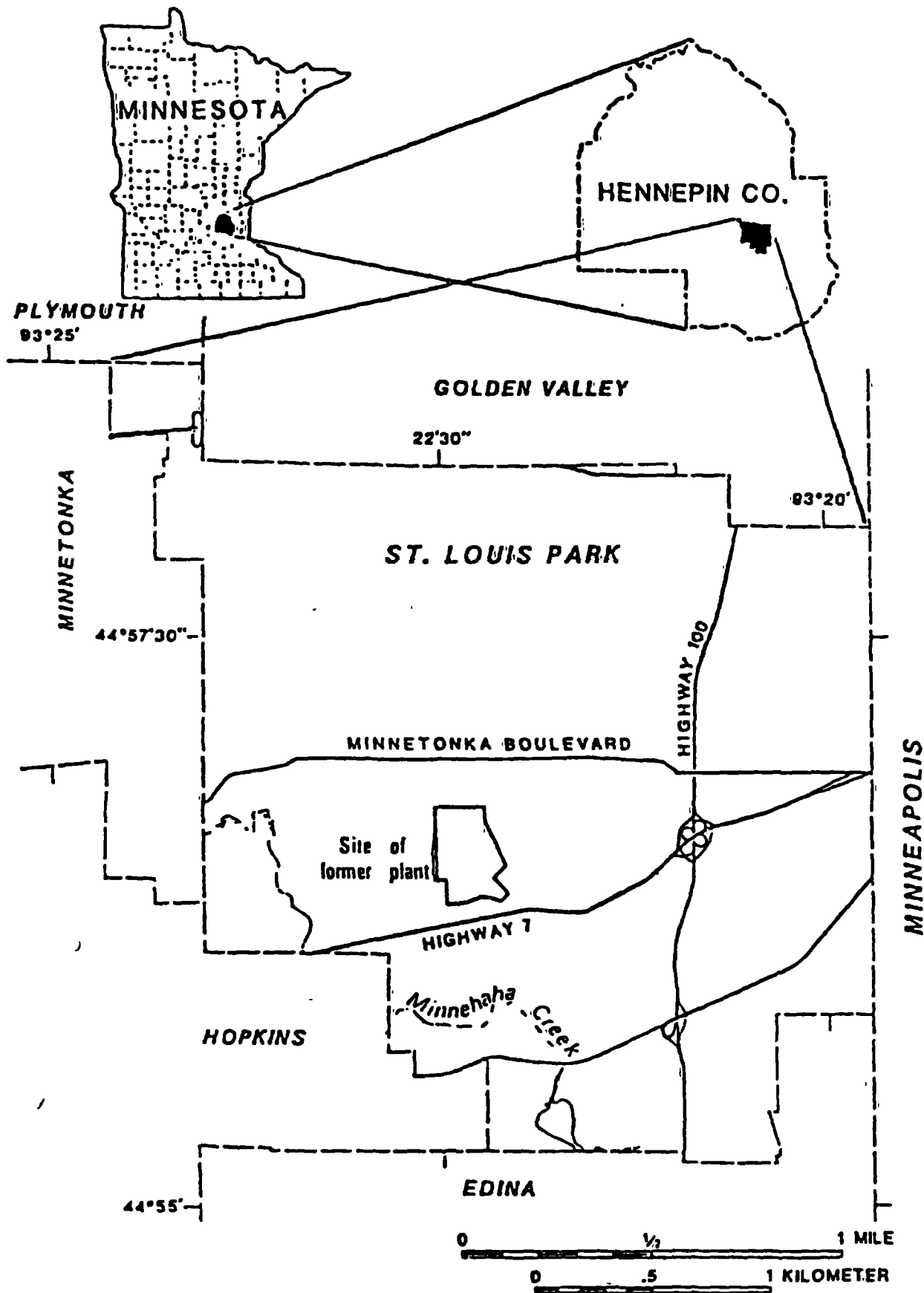
This Site Management Plan outlines the scope of work to be performed in order to identify and investigate leaking multi-aquifer wells affecting the Prairie du Chien - Jordan, Iron-ton - Galesville, or Mt. Simon - Hinckley Aquifers within a portion of the City of St. Louis Park, Minnesota. This work shall be completed in accordance with the Consent Decree - Remedial Action Plan (RAP) for the Reilly Tar & Chemical Corporation National Priority List (NPL) site in St. Louis Park, Minnesota. Included in this plan are: 1) background information; 2) the Well Investigation Plan; and 3) reporting requirements.

### BACKGROUND

The former Reilly site occupies 80 acres in St. Louis Park (Figure 1). A coal tar refinery and wood preserving plant was operated at the site from 1917 to 1972. In 1972 the site was sold and converted to residential and recreational uses. Also a divided four lane avenue and storm sewer improvements were constructed on the site. Soil and surficial ground-water contamination by a variety of coal-tar-related chemicals have been observed in the immediate vicinity of the former plant site. In addition, polynuclear aromatic hydrocarbons (PAH), which are constituents of creosote and coal tar, have been measured in some of the bedrock aquifers in the St. Louis Park area.

The RAP was developed to alleviate the contamination problem in St. Louis Park and it includes the installation of a granular activated carbon (GAC) drinking water treatment system at St. Louis Park municipal wells numbers 10 and 15; a system of pumping wells designed to remove and/or control the flow of PAH and phenolic contaminants in aquifers beneath St. Louis Park; remedial actions at and around the site which will reduce the infiltration of water, thus controlling the movement of PAH and phenolics from contaminated surficial geological deposits and allowing for safe use of the site and adjacent contaminated areas; monitoring of contaminants in all aquifers and in drinking water for St. Louis Park and selected neighboring communities to track the movement of contaminants and monitor their occurrence in drinking water; and other actions which will be implemented if contaminants are found to move in a manner which is not anticipated at this time.

The three aquifers of concern for this multi-aquifer well investigation are the Prairie du Chien - Jordan, Iron-ton - Galesville, and Mt. Simon - Hinckley Aquifers. Pumping wells will remove and/or control the flow of PAH and phenolic contaminants in each of these aquifers. Pumping wells in the Prairie du Chien - Jordan aquifer comprise a gradient control system that will capture ground water in the area of St. Louis Park defined in the RAP as follows: the southern boundary is Excelsior



(From USGS Water Supply Paper 2211)

FIGURE 1  
LOCATION MAP

Boulevard west of Highway 160/100 and West 42nd Street east of Highway 169/100; the eastern boundary is France Avenue; the northern boundary is a line extending from well SLP 7 to the intersection of France Avenue and Minnetonka Blvd., and west from SLP 7 to Hennepin County Road 18; and the western boundary is Hennepin County Road 18 (Figure 2). Contaminated water in the Prairie du Chien - Jordan Aquifer lies within the capture area of the gradient control system.

Multi-Aquifer Well Hydraulics. Any well that is hydraulically connected to more than one aquifer is by definition a multi-aquifer well (MAW). Such wells may provide pathways for shallow contaminants to migrate into deeper aquifers. Recognizing this potential problem, the Minnesota Water Well Construction Code now prevents the construction of MAW. Most MAW are therefore old and the corresponding lack of information necessitates this investigation.

The movement of water between aquifers in a MAW may be due to original open-hole construction, leaks in the casing, and/or flow in the annular space between casing and borehole. Water may then flow from one aquifer to another in response to differences in hydraulic head between aquifers. Within the study area the hydraulic head decreases with depth, and flow in MAW is downward. The water level in a MAW is a function of each aquifer open to the well (Figure 3), and local ground water gradients may be modified as a result (Hult and Schoenberg, 1984).

Consent Decree Requirements. The RAP requires that within one year of the Effective Date, a plan for investigating suspected deep multi-aquifer wells must be submitted to the Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Health (MDH), and the U.S. Environmental Protection Agency (EPA). Wells which may be leaking water exceeding any of the Drinking Water Criteria for PAH or 10 micrograms per liter of phenolics into the Mt. Simon - Hinckley Aquifer, Ironston - Galesville Aquifer, or portions of the Prairie du Chien - Jordan Aquifer located outside the capture area of the Prairie du Chien - Jordan Aquifer gradient control system (Figure 2) must be investigated.

The techniques for analyzing each such suspected deep multi-aquifer well must include at a minimum for each well: static water level measurements; water quality monitoring; spinner logging; caliper logging; and E- or natural gamma logging. Additional investigation techniques such as downhole television logging are permitted.

Previous Study. In 1983, E.A. Hickok & Associates (Hickok) compiled a table of information for all of the wells in the study area (Figure 2). Information collected from drillers, government agencies, and a door-to-door survey included: unique well number; owner; location; geologic log; casing schedule; depth; and current status (active, inactive, existence uncertain, abandoned). The Hickok study area includes the entire capture zone for the Prairie du Chien - Jordan Aquifer gradient

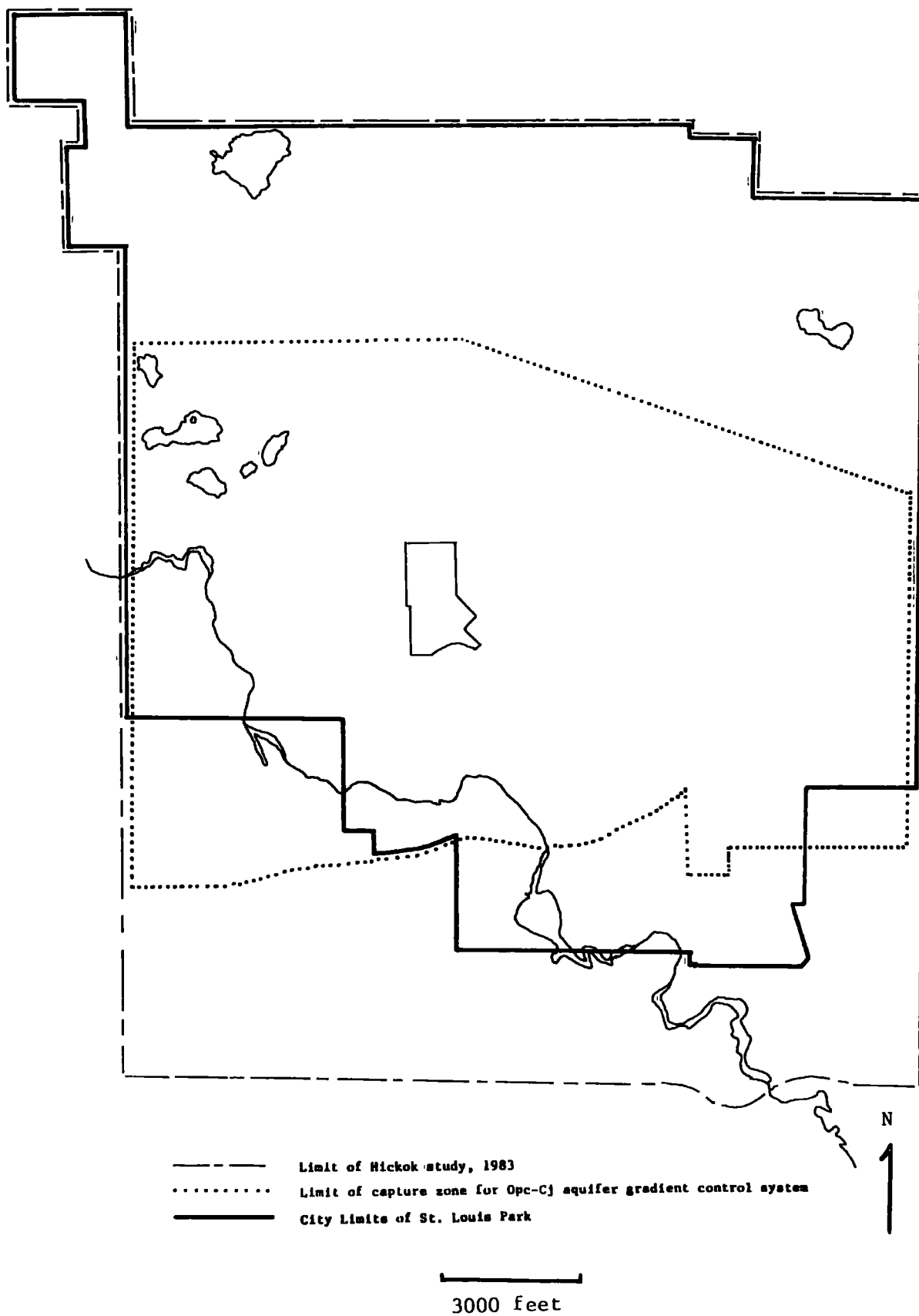


Figure 2. Capture Area of the Prairie du Chien-Jordan Aquifer Gradient Control System, and Project Area of Hickok Well Search Study (1983).



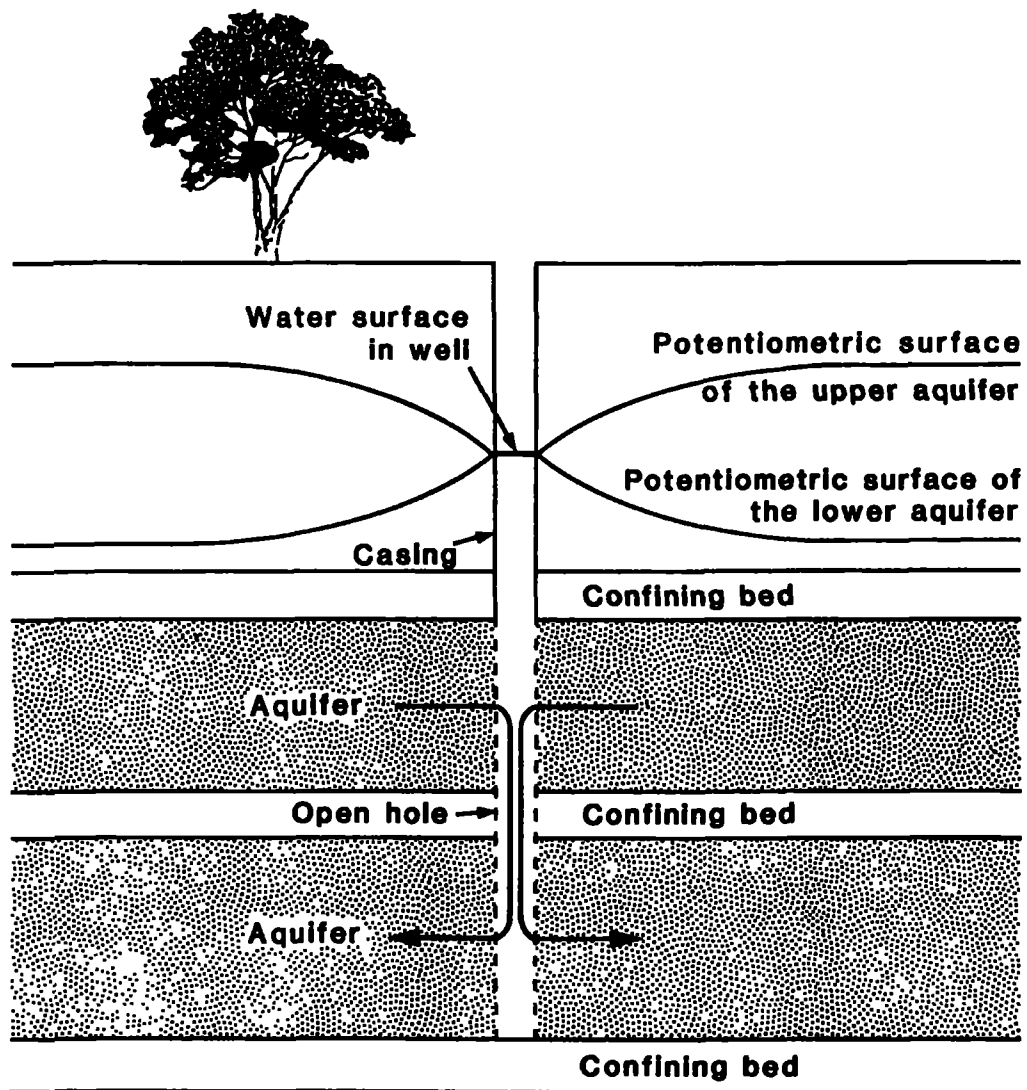


Figure 3. Schematic Hydrologic Section Showing MAW Hydraulics.  
From Hult and Schoenberg, 1984.

control system (Figure 2). The Hickok table provides information on all wells identified by previous studies of the Reilly site, including all wells known by the USGS.

Suspected Deep MAW. The areal extent of contamination in the Prairie du Chien - Jordan and all above lying aquifers lies within the capture area of the Prairie du Chien - Jordan Aquifer gradient control system. Therefore, in accordance with the RAP, MAW that terminate in the Prairie du Chien - Jordan Aquifer that are located within the gradient control system capture area are excluded from the Investigation Plan. Prairie du Chien - Jordan Aquifer MAW outside the capture area are excluded from the Investigation Plan because contamination has not been found to extend that far. Based on the current knowledge of the extent of contamination in the above-lying aquifers, only Ironton - Galesville and/or Mt. Simon - Hinckley Aquifer MAW within the capture area of the Prairie du Chien - Jordan Aquifer gradient control system need to be investigated.

The Hickok study identified five deep MAW that were formerly open to the Mt. Simon - Hinckley or Ironton - Galesville aquifers (W38, Milwaukee Road Railroad; W23, Republic Creosote; W50, Prestolite well; W105, Minnesota Sugar Beet; W107, Interior Elevator). However, four of these have been abandoned or reconstructed as single-aquifer wells by Reilly or the State, while the location of the fifth (W107) remains unknown after a two year search by City of St. Louis Park, the MDH, and the USGS. Since this deep MAW cannot be located, no investigation of it is possible. It therefore appears there are no suspected deep MAW to be investigated.

Notwithstanding this result, the Hickok study lists approximately 300 wells for which there is limited information. By inspecting City of St. Louis Park zoning records, many of these wells were found to be located on residential property, and are anticipated to be shallow (Drift - Platteville or St. Peter Aquifer wells). Therefore, the residential wells will not be investigated as part of this deep MAW plan. There are 37 remaining wells (Table 1) that are located on properties that are zoned commercial, industrial, or other non-residential uses. These 37 wells will be the subject of this MAW well investigation plan.

#### WELL INVESTIGATION PLAN

Reasonable efforts will be made to determine the location and existence of each well listed in Table 1. It may not be possible to locate all 37 wells listed in Table 1 because: 1) the information gathered by Hickok that provided evidence that a particular well exists may be incorrect, and 2) a particular well may be hidden or destroyed due to recent land use changes (e.g., construction or demolition activities).

The investigation of existing wells listed in Table 1 will start with static water level measurements and well depth measurements. These two measurements will be used to determine if the well is deep enough to penetrate the Ironton - Galesville Aquifer or deeper. The static water level

**TABLE 1**

	<u>Unique Well #</u>	<u>Owner</u>	<u>Location</u>
1.	216101		USGS
2.	232595	NON-RESPONSIVE	
3.	232741		
4.	232615	Standard Plumbing	8015 Minnetonka
5.	232598	Home Hardware	6414 W. Lake Street
6.	232543	Brent Displays	5807 Excelsior
7.	232514	Nelson House/Carny	6006 Excelsior
8.	232651	Consumer Brokers	3521 Webster Ave.
9.	216079		Oxford & Edgewood
10.	227901		Lake & Hampshire
11.	232825	Managers Serv., Inc.	6500 Oxford
12.	227961		35th & Raleigh
13.	232671	MN Cash Register	5614 W. 36th St.
14.	232681	Pic-A-Pop	3550 Brunswick
15.	232518	S & S Welding	6506 Cambridge
16.	232683	H. J. Shotwell Co.	5721 W. 36th St.
17.	232569		29th & Hillsboro
18.	232516		6314-18 Cambridge
19.	232515		6305 Cambridge
20.	232521	Viking Soap & Chem	6529 Cambridge
21.	232519	S & S Welding	6510 Cambridge
22.	232574	Engleside Dairy	4900 Excelsior
23.	232619	SW Corner	Natchez & Minnetonka
24.	232620	Ganyo, Earl J.	3020 Natchez
25.	232540	Ostund Jewelry	5405 Excelsior
26.	232760	NON-RESPONSIVE	
27.	232541	Wooddale Office Bldg.	
28.	232542	Fanny Farmer #132	5401 Excelsior
29.	232539	Warner Hardware	5025 Excelsior
30.	233364		
31.	233365		
32.	232920	NON-RESPONSIVE	
33.	232801		
34.	232503		
35.	232750		
36.	232628		
37.	233316		

measurements should indicate if the water level in the well matches the water level expected for a well of the depth that is measured. This will eliminate the potential uncertainty that could result if the well was obstructed and only a depth measurement was made. If the depth and static water level measurements result in any uncertainty as to whether or not the well is a possible Ironton - Galesville or Mt. Simon - Hinckley Aquifer, MAW, then the well will be inspected and logged using downhole video equipment. If proper physical access is available, then any obstructions will be removed from the well, if possible.

Figure 4 shows the elevation of the top surface of the Ironton - Galesville Aquifer in the St. Louis Park area. The approximate surface elevation of each well will be compared with Figure 4 to determine if the measured well depth is sufficient to suspect that the well may be a candidate deep MAW.

Candidate deep MAW will be further investigated by making geophysical logs and collecting ground water samples. The geophysical logs will include spinner (flow) log, caliper log, and natural gamma log. Ground water samples representative of the deepest aquifer penetrated by the well will be collected and analyzed for PAH and phenolics. For this purpose, samples will be collected from the discharge of a submersible pump positioned at the level of the deepest aquifer penetrated by the well, once field measurements of pH, conductivity, and temperature have stabilized in accordance with MPCA procedures (Sabel and Clark, 1985).

#### REPORTING

Upon completion of all field and laboratory activities, a report will be issued that includes the findings of the investigation and recommendations for MAW reconstruction or abandonment. The report will contain all data collected during this study including field measurements and copies of geophysical logs. Video logs of the wells will be described in the text of the report, and will be retained by the City of St. Louis Park for subsequent viewing by the agencies if requested. The report will be issued within one year of approval of this Investigation Plan, as required by the RAP.

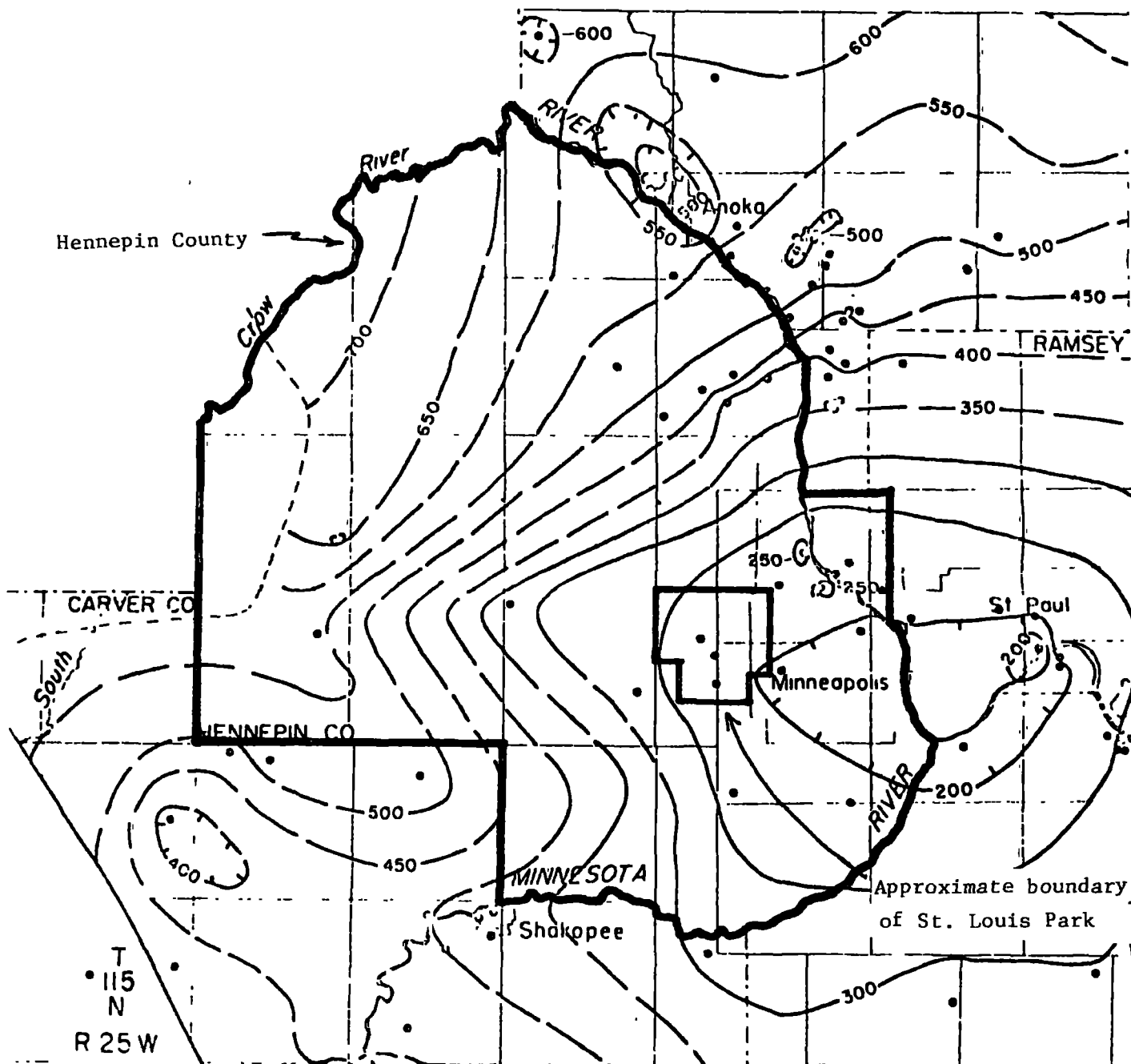


Figure 4. Structure Contours at the Top of the Iron-ton-Galesville Aquifer in Hennepin County. From Norvitch, et al., 1974.

## REFERENCES

City of St. Louis Park Zoning Records, 1987.

E.A. Hickok and Associates, 1983. "Technical Memorandum, February 16, 1983, Tables Revised, June, 1983: St. Louis Park Well Abandonment Project - Well Search and Inventory."

Hult, M.F. and M.E. Schoenberg, 1984. "Preliminary Evaluation of Ground-Water Contamination by Coal-Tar Derivatives, St. Louis Park Area, Minnesota." U.S. Geological Survey Water - Supply Paper 2211.

Norvitch, R.F., T.G. Ross, and A. Brietkrietz, 1974. "Water Resources Outlook for the Minneapolis - St. Paul Metropolitan Area, Minnesota." Prepared by the U.S. Geological Survey and published by the Metropolitan Council of the Twin Cities Area.

Sabel, G.V. and T.P. Clark, 1985. "Procedures For Ground Water Monitoring: Minnesota Pollution Control Agency Guidelines." April 1985.

**SECTION B**

**QUALITY ASSURANCE PROJECT PLAN**

**QUALITY ASSURANCE PROJECT PLAN  
FOR THE INVESTIGATION PLAN  
FOR LEAKING DEEP MULTI-AQUIFER WELLS**

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## 1.0 INTRODUCTION

### 1.1 Background

ERT and the City of St. Louis Park will complete certain tasks in fulfillment of the Consent Decree and Remedial Action Plan (RAP) for the Reilly Site. This Quality Assurance Project Plan pertains to all work to be performed by ERT and other contractors to investigate suspected leaking multi-aquifer wells affecting the Prairie du Chien - Jordan, Ironston - Galesville, or Mt. Simon - Hinckley Aquifers. Activities to be undertaken during the investigation include: existing record review; measurements of well diameter, static water level, and well depth; caliper logging; spinner logging; natural gamma logging; downhole television logging; and ground water sampling and analysis for Drinking Water Criteria and Phenolics concentration. Further details on the work to be performed, its purpose and the methodology to be employed may be found in the Site Management Plan. This work is scheduled for completion within one year of approval of this plan pursuant to Section 10.1.2 of the RAP.

### 1.2 Quality Objectives

The purpose of this Quality Assurance Project Plan is to define the Quality Assurance and Quality Control provisions to be implemented to ensure that:

- o The data generated will conform to the specifications of the Site Management Plan.
- o The work is performed in an efficient manner.
- o Field records generated during the course of the field work are complete and accurate.
- o The objectives of the Consent Decree are met.

## 2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization is illustrated in Figure 2-1. The Project Manager, Mr. William Gregg will oversee and coordinate all project activities and will conduct correspondence with St. Louis Park. The Project Manager/Field Coordinator is also responsible for maintaining records of the work performed on the project and for archiving those records in the Central File upon completion of the work. The Project Quality Assurance Officer is responsible for ensuring that this plan is implemented and that project data undergo technical and peer review, as necessary. The U.S. EPA, MPCA, and MDH will have the opportunity to audit, comment on, or otherwise participate in Quality Control procedures, and inspect the work done on this project at any time.

## 3.0 QA/QC - FIELD ACTIVITIES

### 3.1 Training

All field personnel working on the Leaking Multi-Aquifer Well Investigation (including subcontractors) will receive training on the purpose of the work, the procedures to be employed and the project Health and Safety Plan.

### 3.2 Subcontractor Quality Control

Subcontractor quality control is that system of activities which ensures that products or services obtained from subcontractors fulfill the needs of the project.

Periodic quality control inspection of each contractor will be performed by the ERT Project Manager/Field Coordinator to evaluate adherence to the QA Project Plan and the project Health and Safety Plan. Inspection will include (as appropriate):

- o Type and condition of equipment,
- o Calibration procedures,
- o Personnel qualifications,
- o Decontamination procedures,
- o Documentation,
- o Level of personal protection

Decontamination of down-hole equipment (e.g., geophysical instruments or drilling tools) will be accomplished by washing with soap and water and/or by steam cleaning between wells, as appropriate.

# QUALITY ASSURANCE PROJECT PLAN

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 Revision: 0

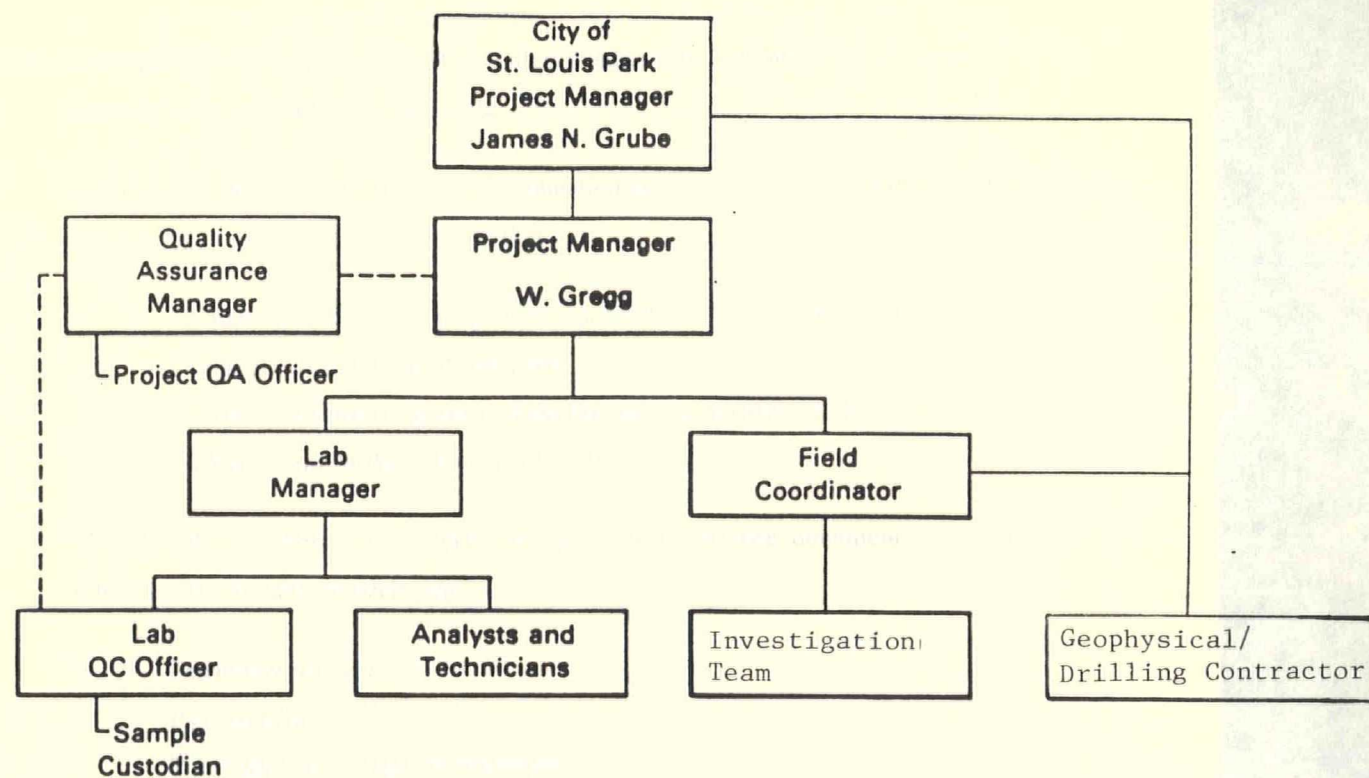


Figure 1-1 Project Quality Assurance Organization

SECTION D

COMMUNITY RELATIONS PLAN

## **COMMUNITY RELATIONS PLAN**

The Investigation Plan for Deep Multi-Aquifer Wells is to be completed in accordance with the Consent Decree - Remedial Action Plan for Reilly Tar & Chemical Corporation's St. Louis Park, Minnesota, N.P.L. Site. All community relations programs related to this work will be coordinated through the following agencies:

United States	Ms. Judy Beck United States Environmental Protection Agency (312) 353-1325
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State of Minnesota	Ms. Susan Brustman Minnesota Pollution Control Agency (612) 296-7769
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City of St. Louis Park	Ms. Sharon Klumpp City of St. Louis Park (612) 924-2523
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Information necessary to conduct the Community Relations Plan will be provided by the City and Reilly.

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